PEST TECHNOLOGY
Pest Control and Pesticides

Technical Editor - A. K. Palmer, B.Sc.

A RHODES PUBLICATION

Vol. 2. No. 8 **May, 1960**

CONTENTS

★

Published by:
Rhodes Industrial Services Limited,
Four Avery Row, Grosvenor Street,
London, W.1.
MAYfair 4265

Pesticide hazards as imagined by the layman and seen by the expert

Quote from British Press:

" *The typical British Farm.*"

" *Upon it there rains down a continuous drizzle of poisons, lethal not only to wild flowers, but to birds, bees, butterflies and other insects, most of which are highly beneficial to the land.*

" *The typical British farm will soon be without hedges, trees, or woodlands. Any wild life that escapes being poisoned will thus have no where to live.*

" *The land itself will start to shift. Wind and rain will carry away that rich topsoil upon which four centuries of devoted effort has been lavished. In its place—a dust bowl.*"

Quote from an American Journal:

" *Farm Fallout Can Kill You.*"

" *In the headlong race to kill every bug and weed in sight, chemists are spreading a blanket of mysterious death over the land.*"

" . . . . *we and our unborn children, together with much of our fish and game face a future of sterility, deformity and possible tremendous upsurge of cancer, because of poisons being flung almost heedlessly about the country.*"

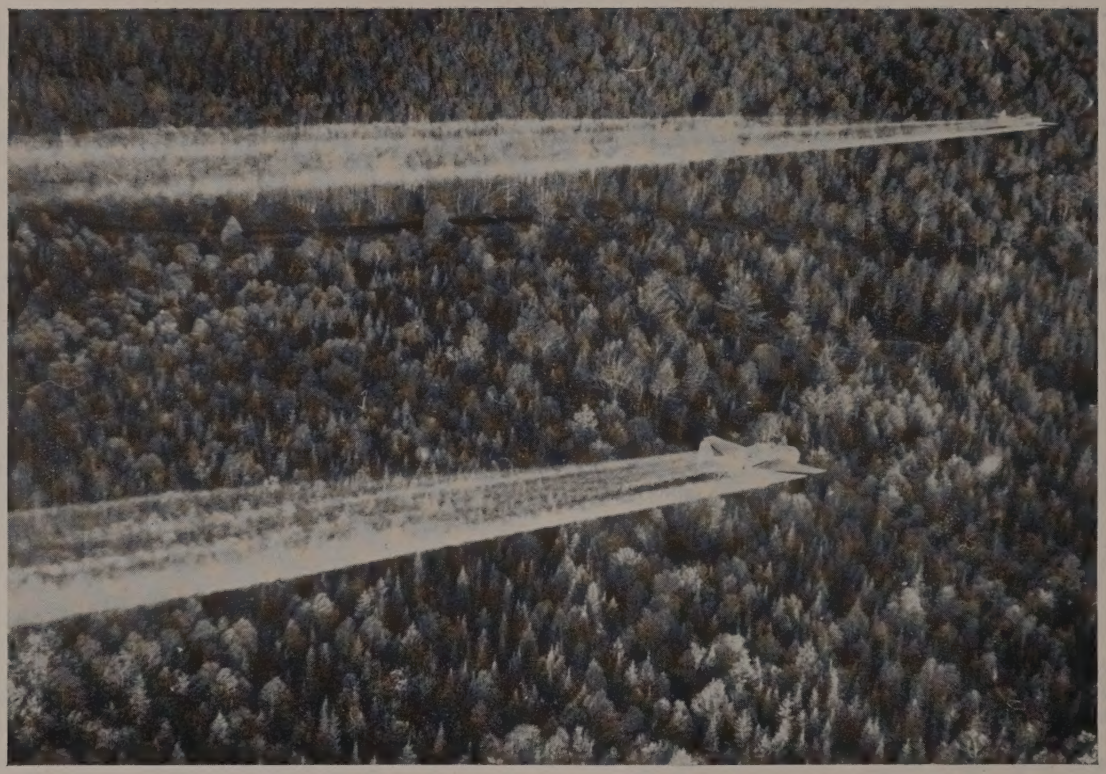
" *Mostfruitis sprayed, and these poisons won't rub off or wash off. The mother nursing her precious baby maybe poisoning it. Anyone having his home debugged is probably poisoning himself and his family.*"

The above are just two examples of ill-advised publicity which has been given to pesticides, and it is certain that our readers have come across numerous other examples of such infuriating, ill-considered, ill-advised and prejudiced criticism. Whilst not setting ourselves up as expert exponents of the English language we cannot help feeling, in fact knowing, that the flowing phrases and dramatic content of these articles has been obtained at terrible expense—the corruption of truth.

In these circumstances it is heartening to receive from the European and Mediterranean Plant Protection Organisation the latest report of the Working Party on Crop Production Pesticides which in clear, concise language deals with " The Need for Chemical Control and Steps Taken to Safeguard Public Health ".

The particular value of this publication, which puts the case for the rational use of pesticides with cool commonsense, is that it has been written by a working party of expert Government Scientists from Austria, Belgium, Holland, Germany, and Great Britain. Even those with a " muck and mystery " axe to grind cannot accuse the party members of making out a case to feather their own nests, and the party's independent and expert confirmation of the case for pesticides, recently put forward by ABMAC (*Pest Technology*, **2**, (7), 140-145), is a severe ' smack in the eye ' for the anti-chemicals brigade.

Continued on page 166.



Spraying forests in New Brunswick to prevent killing of trees by spruce budworm. Planes flown in pairs. Flight lines spaced to give ½lb of DDT per acre. Drift ensures coverage.

Photo. Canada Dept. of Agriculture.

RELATIONSHIPS BETWEEN CHEMICAL AND BIOLOGICAL CONTROL OF FOREST INSECTS

By R. E. BALCH *Forest Biology Laboratory, Fredericton, N.B., Canada.*

Part I. General introduction and chemical control.

THE FUNDAMENTAL PROBLEM in economic entomology is the capacity of insects to multiply. This is so great that most species will increase in numbers unless some 99 per cent of their potential offspring are prevented from maturing in each generation. A decrease of only 1 per cent in the total mortality may double the numbers of the next generation and the rate of increase is in geometric progression as long as it continues.

Nature has evolved a variety of complex systems to control this superabundant capacity for reproduction. It is limited by the mortality caused by a host of interacting factors: parasites, predators, diseases, inter- and intra-specific competition for food and shelter, and the physical conditions in the environment. These natural systems, however, have evolved to varying degrees of efficiency. They are also subject to disturbance by changes in the environment such as those produced by weather or cultural operations. Thus the numbers of different species, and of any one species in different times and places, are controlled at different levels.

A species becomes a pest when natural controls fail to keep its numbers below the level at which damage results. The task of the economic entomologist is to discover the cheapest and most efficient means of improving or supplementing the existing complex of natural controls so that the population will be regulated below this level.

Ideally this will be achieved by the use of natural mortality factors. By modifying cultural practices it may be possible to create environmental conditions that will increase the effectiveness of those already present, or new factors such as natural enemies may be introduced. Success will depend, however, on the level below which the population is permanently regulated. The conditions under which many agricultural crops must be grown often create an environment so favourable to certain insects that natural factors alone are unable to give the required protection.

Chemical Control

Lack of knowledge and the need for quick results have encouraged the more direct approach of simply poisoning insects when they get too numerous. A large number of potent insecticides have been developed and an efficient industry has arisen to supply the growing demand. There are few insects for which effective poisons are not available and many crops cannot be grown without them.

The reliance on chemical insecticides has, however, been meeting with increasing scepticism and opposition. The development of resistance has cooled the optimism that followed the discovery of DDT and has led to intensive research on alternative poisons. The resurgence of outbreaks and the increase of other pests following the use of insecticides have focussed attention on the need for more selective methods. Fear of undesirable effects on beneficial insects, fish, wildlife, and human beings themselves is becoming a political issue.

Much of this opposition is uninformed. Evidence

Type of airstrip constructed for spraying spruce-fir forests in Eastern Canada. *Photo. Canada Dept. of Agiculture*

is often magnified or distorted and based on false correlations. It is, however, not without foundation and serves to remind us that if the great value of insecticides is to be realized they must be used with discretion and with due regard for their ecological effects.

It should be emphasized that killing insects is not necessarily the same as controlling them. Control implies regulation and the real " control factors " are those that destroy a larger percentage of the population when it is high than when it is low. In other words, the severity of their action must depend on population density and be directly related to it. Competition acts in this way. Many parasites and predators have this capacity, although their responses to population changes are generally delayed. Other mortality factors, such as unfavuorable weather or insecticides, may cause higher mortalities and have important influence on the control complex; they may determine the pest density at a particular time, and which control factors are brought into play, but if their action is independent of density they cannot regulate it. Unless they exterminate the insect they alone cannot prevent it eventually increasing to the point where shortage of food, or some other requisite, prevents further increase; and this will generally be above the level of economic damage.

This is part of the theory that best explains the behaviour of insect populations. The theory, as elaborated by Nicholson, has been criticized.[1] It has not been definitely proved that populations are actually regulated in nature by " density-dependent " or " density-governing " factors but the alternative theory that insect numbers can be determined by independent factors fluctuating at random contains a very large element of improbability. There is much circumstantial evidence that insect numbers are regulated by combinations of density-dependent factors at low as well as high levels. Studies of a long series of generations of the European spruce sawfly, *Diprion hercyniae* (Htg.), and the black-headed budworm, *Acleris variana* (Fern.), show that population trend could be predicted from percentage parasitism.[2] In the former case, mortality from a virus disease also was related to population trend, suggesting that parasitism and disease were responsible for maintaining the population at a low mean density.[3] Life-table studies of other species, now in progress by Morris and his associates at the Fredericton Laboratory are providing additional evidence of regulation.

Insecticides can be made to operate in a density-dependent fashion, but only if they are applied persistently whenever the pest reaches the level at which control is necessary. When the maximum tolerable level is low they may have to be applied in each generation. This is economically practicable with crops of high value per acre and it may become a necessary, if undesirable, part of the cost of production; but it is seldom practicable in forestry.

There is a danger that chemical control may become a routine practice without regard for the dynamics of the populations affected. It may be used unnecessarily when natural control is about to take place or could be promoted by less expensive modification of cultural practice. Insecticides may disturb natural systems and create new problems. The danger should not be exaggerated, nor should it be ignored. We have reached the stage when the empirical approach needs to be redirected by more fundamental research in population ecology. Both chemical and biological methods need to be assessed by quantitative studies. They should not be in conflict. Both seek to control the capacity of pests to multiply, which is already subject to certain natural limitations. Both introduce new mortality factors into dynamic systems that are as yet imperfectly understood.

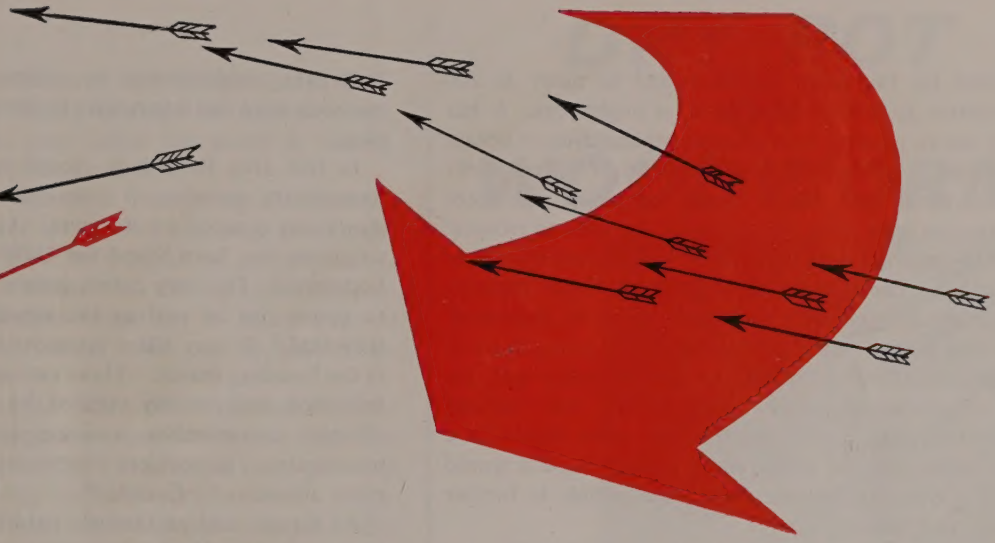
Insecticides have been used much less frequently in forestry than in agriculture. There are good reasons for this. Most forest crops take 50 to 100 or more years to grow; the annual yield per acre is relatively small, and the cost of protection must be correspondingly low. Also, trees can tolerate relatively high degrees of infestation by most pests, although there are notable exceptions such as the balsam woolly aphid, *Adelges piceae* (Ratz.), and the white pine weevil, *Pissodes strobi* (Peck), which affect the form of the tree or the quality of the wood. With many species relatively modest reductions in the intensity of length of outbreaks by biological means will prevent serious damage and their complete suppression by insecticides is not necessary. In addition, forest stands are generally more complex and stable ecosystems than the annually-harvested monocultures of agriculture; they offer a more favourable environment for the maintenance of natural systems of control.

Biological methods, however, take time both to discover and apply. The longevity of the forest crop does not permit rapid changes in methods of culture and experiments to test them are correspondingly lengthy. The use of natural enemies and diseases often calls for prolonged investigations and results may be slow and uncertain. In the meantime insecticides may provide the only solution and considerable advances have recently been made in their use against forest insects.

The discovery of DDT and other potent insecticides has reduced necessary dosages to as little as 1/4 lb. per acre. The difficulties of application over forested areas have been solved by the use of the aeroplane.[4] This is illustrated by the spraying operations in Canada and the United States against the spruce budworm, *Choristoneura fumiferana* (Clem.). In Eastern Canada alone spraying operations have totalled some 18 million acres since 1952.[5] Twenty-two airstrips have been con-

---

* *Contribution No.* 631, *Forest Biology Division, Research Branch, Department of Agriculture, Ottawa.*



a killer you don't have to handle with care

SEVIN Insecticide—a new kind of pesticide—Powerful Enough to Kill Resistant Insects, Yet Safer to Handle than DDT.

Years of Union Carbide research has developed a new kind of insect killer, SEVIN Insecticide, that is chemically different from any other insecticide now in commercial use. SEVIN is a powerful carbamate and has proved highly effective against fruit and vegetable insects, forest and ornamental pests, animal ticks and lice—*even those insects that have developed resistance to other insecticides.*

SEVIN Insecticide potency lasts longer in the field and fewer sprayings are required to do an effective job. SEVIN appears less toxic to humans and animals than DDT. Field workers can continue operations immediately after a SEVIN spraying.

SEVIN has no objectionable odor and is compatible with most other chemicals so you can combine a complete insect control program in one formulation.

Find out how SEVIN can help you control insect damage and improve the quality of your crops. Write today for detailed information CPT 5 to the Chemicals Department, Union Carbide International Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y., U. S. A., Cable Address: UNICARBIDE, New York.

PHYSICAL PROPERTIES: CHEMICALLY PURE 1-NAPHTHYL N-METHYLCARBAMATE IS CHARACTERIZED BY:

appearance	white, crystalline solid
odor	essentially odorless
melting point	142 deg. C.
vapor pressure	less than 0.005 mm. Hg at 26 deg. C.
density	1.232 at 20/20 deg. C.

UNION CARBIDE
TRADE MARK
Chemicals

structed for this huge operation and as many as 200 aeroplanes have been involved in a single year. It has been shown possible with efficient organisation to obtain satisfactory coverage during the two or three weeks within which the insect should be killed. Sufficient foliage has been preserved to permit the trees to recover.

In the past this insect has killed tremendous quantities of timber. The growth of the Pulp and Paper Industry has made it imperative that such losses be prevented. The cost is high but is considered by the industry to be fully justified by the results to date. Studies with the aid of unsprayed check areas indicate that without spraying a large part of the forest resource would have been killed and the young stand that replaced it would be of a type that becomes highly susceptible to further attack as it matures.

The end results of the operation in Eastern Canada are not yet known. The outbreak is now greatly reduced but over two million acres are still dangerously infested and there is a possibility of resurgence. Careful population studies indicate that the spraying has not had an adverse effect on the control value of the parasites or predators of the budworm, which play a part in the collapse of outbreaks and in control between outbreaks. It has, however, maintained the source of food by preventing the death of the trees. As reduction of the food supply through tree mortality has been a factor in the termination of previous outbreaks, it remains to be seen whether the preservation of the trees can prevent the normal collapse of such outbreaks.

This example illustrates the value of chemical control when other methods are impracticable. It also illustrates the necessity of applying it with due regard for the population dynamics involved and for the possibilities of other methods. The policy to date has been to resort to spraying only after studies indicate that it is necessary to prevent the killing of trees. A method of estimating this hazard, based on egg sampling and the condition of the trees, has been worked out by Webb.[6] It is not considered practicable to suppress outbreaks of this insect in their early stages, although the possibility has not been tested. Spraying has been resorted to only after it is known that natural control will not prevent serious damage.

At the same time an intensive study of budworm populations at different densities and in different stand types is being carried on.[7] Results to date support the conclusion, based on observations of previous workers, that the susceptibility and vulnerability of the forest can be reduced by certain management practices. Owing to the size and nature of the Canadian forests the creation of a resistant forest will inevitably be a gradual process. It will also depend on the prevention of widespread killing of trees, which results in the re-creation of large areas of even-aged, highly susceptible stands that are difficult to protect. The ultimate solution seems to lie in silvicultural management that will reduce the severity of outbreaks, supplemented by chemical or other direct methods when this is necessary to protect the management plan.

In this area there is a special reason for avoiding unnecessary spraying; it contains some famous salmon rivers and is noted for its game. As yet no satisfactory substitute has been found for DDT against the spruce budworm.[8] This very potent general insecticide is lethal to young fish as well as the aquatic fauna on which they feed.[9] It may affect insectivorous birds, especially in the breeding season. These undesirable results can be mitigated, and possibly avoided, by using the minimum effective concentration and amount per acre of the insecticide. The problem of preventing them is receiving close attention in Canada.[10]

All forests, and particularly natural forests, support a large complex of interdependent organisms, many of economic or aesthetic value. Nature lovers, sportsmen and ecologists quite rightly stress the dangers of wholesale application of poison: beneficial species may be killed, the natural balance of populations may be disturbed. Exact knowledge of such effects is, however, limited. Few really exhaustive studies have been made and generalizations are impossible for the effects of insecticides will vary with the type of forest, the formulation and dosage used, and the time of application.

The available information does suggest that occasional spraying of limited areas will have no permanent deleterious effects owing to the capacity of species to re-occupy their various niches by multiplication of the residual population or by invasion from untreated areas. Repeated or large-scale spraying may be another matter. The extensive operations against the spruce budworm in New Brunswick throw some light on this.

Slightly over 6 million acres in this Province have been sprayed one or more times with DDT, in an oil solvent, between 1952 and 1958. Of this area 26% was sprayed once, 34% twice, 31% three times, and 8% four times. In 1952, 1 pound per acre was used on 0.2 million acres; the rest was sprayed with 1/2 pound per acre. The largest area treated in any one year was 5.2 million acres. There was high mortality in most insect species that were present in the adult stage at time of spraying and in all aquatic species. Blackflies and mosquitoes were almost eliminated for the season—to the relief of those working in the area. Many parasitic and predacious insects were killed. The percentage parasitism of the budworm, however, was not reduced and no outbreaks of other insects have resulted. Whatever the effects on the balance of insect populations they have not been unfavourable to the trees. Nor do there seem to have been any measurable effects on birds. Although studies have been limited, no evidence could be found of mortality in nestlings or adults of small birds after spraying with 1 pound per acre. Observations supported by an annual census on two plots showed

no changes in populations of birds attributable to DDT. It is possible that birds dependent on aquatic insects, such as ducklings, may suffer but proof is lacking. Mammals appear to be unaffected.

Fish are more vulnerable. Studies by the Fisheries Research Board have shown that very large percentages of young salmon have been killed by as little as 1/2 pound per acre.[9] Grilse and mature salmon appear to be immune. Serious reductions in future runs of salmon have been forecast[11] but the ultimate effects are not yet known.

These results suggest that the undesirable effects of spraying even large areas are not serious when not more than 1 pound of DDT is used per acre, provided that important fishing waters are not involved. Large-scale tests planned for 1960 will examine the possibility of resolving the fish problem by reducing the dose to 1/4 pound per acre.[5] There is evidence that with good control of droplet size and careful coverage this dose may kill a sufficient proportion of the budworm to protect the trees.

This project is the most serious test yet made of the effects of large-scale spraying. In general, it is reassurring except for the effects on fish, but different results might be obtained under different ecological conditions. It indicates the importance of efficient methods of application and using the minimum effective amount of insecticide. And the fact remains that chemical methods are not a cure-all for forest insect problems. For some species they are not practicable. Many entomologists look upon them as a stop-gap pending the discovery or applicability of biological or silvicultural methods.

To be continued

RELATIONSHIPS
BETWEEN
CHEMICAL AND BIOLOGICAL
CONTROL
OF FOREST INSECTS

Part II. Biological Control, Silvicultural Methods and Conclusions.

To be published in the June issue of
"*Pest Technology*"

AERIAL SPRAYING OF SUGAR CANE IN PAKISTAN

By Dr. H. KAMPF, *Dr. Tech. Sc.* (*Vienna*), *F.R.I.C.* (*London*).

SUGAR CANE is vitally important to Pakistan. It is the main raw-material for the now existing 14 modern sugar mills and for thousands of primitive cane crushers driven by bullocks or camels. During the season 1958/59 about 180,000 tons of white sugar were produced in the factories and roughly 800,000 tons of brown sugar on a cottage industry basis. To satisfy the demand for white and brown sugar of the 80 million people living in East and West Pakistan about 250,000 and 900,000 acres of land have to be kept under sugar cane in the two wings of Pakistan respectively. At present there is only one sugar factory in North-west Pakistan and it is also equipped to process sugar beet after the sugar cane season is over. This factory will go into production for the first time in June 1960 and for this trial run about 7,000 acres in the Peshawar valley have been planted with imported sugar beet seed.

The per-acre output of sugar from cane in Hawaii is the highest in the world, averaging 9.07 tons in 1957. In sharp contrast to this impressive figure one acre in Pakistan yields an average of only 1.10 ton of sugar. Even considering that the soil and the climate in Hawaii suit the growth of the sugar cane and that a highly developed irrigation system has been built, the high difference between the per-acre output there and in Pakistan is remarkable.

One of the main reasons for the high yields in Hawaii is the fact, that for many years the cane growers successfully waged a battle against harmful insects. The measures taken have been so effective that today cane grown in Hawaii suffers less insect damage than cane grown in any other area in the world. The farmers in Hawaii have proved that higher yields per acre can only be achieved with adequate pest control.

Insect pests are a major problem in the cultivation of the sugar cane. Apart from the borers the most serious threat comes from the leaf-hopper (*Pyrilla perpusilla* Wlk.). This insect is prominent in India and Pakistan. Formerly there was no evidence of *Pyrilla* in the newly developed cane area of Thal on the lower Indus but it was introduced there when, in 1956, cut sugar cane was imported from affected areas in North-west Pakistan. Whenever this insect attacks, the leaves and the shoots of the sugar cane are covered with the eggs, nymphs and grown insects. The yield per acre of the infested cane is adversely affected and so is the sucrose content. Statistics show that after a severe epidemic of *Pyrilla* the sugar recovery in the sugar factories may be halved. In other words: 100 tons of healthy cane will yield in Pakistan an average of 8 tons of sugar, while cane damaged by *Pyrilla* may reduce the quantity of recoverable sugar to about 4 tons. *Pyrilla* infected cane causes great losses to the brown sugar industry too.

Till about ten years ago these insects could only be partly controlled and destroyed by inefficient mechanical and cultural operations such as the collection of eggs and

Spraying action being tested before take off

Pakistani helpers mixing endrin

Continued on page 163

Continued from page 162

Beaver of the Department of Plant Protection, Government of Pakistan spraying sugar cane.

heavy doses of Nitrogen. The battle against *Pyrilla*, which was once fought by school children enjoying a holiday and picking the adults and nymphs and killing them in water and kerosene, was fundamentally changed by modern methods based on the introduction of chemical insecticides, especially those of the chlorinated hydrocarbon group. These new, synthetic insecticides like DDT, BHC, aldrin, dieldrin and endrin were applied in various forms, but primarily as dusting powders and sprays.

Following successful trials at the Indian Institute of Sugarcane Research, Lucknow, and at the Sugarcane Research Station, Jullundur, endrin was used for large scale anti-Pyrilla campaigns in India. In the beginning spraying of the affected sugar cane fields with endrin was done with hand-operated spraying equipment and power sprayers from the ground. Although it was sometimes tiresome for the operators to walk through the dense cane crop, endrin proved immensely successful against *Pyrilla*.

B. D. Gupta and P. N. Avasthy report in "*Indian Sugar*", February 1955, pp. 557-559, that, for the first time, aerial spraying of endrin against *Pyrilla* was tried in India in the autumn of 1954, when an area of 650 acres of heavily infested sugar cane crop was treated at the rate of 0.2 lbs. of actual endrin per acre. The aircraft used for this demonstration in Sehore, Bhopal State, was one of the Pipercubs of the Hind Flying Club, Lucknow. It took about a week to spray the selected area and the total cost came to only sh. 15 per acre, approximately one third of this was the hire and the fuel etc. for the aircraft and the balance the cost of the endrin. An inspection of the area 24 hours after spraying disclosed that the nymphs and adults of the *Pyrilla* were dying and in four days the mortality was complete. The insects were eradicated and not one could be detected alive in the crop sprayed with endrin.

After these spectacular and convincing results the Plant Protection Department was founded by the Government of Pakistan and a well organised service established in both wings of Pakistan. For the aerial spraying of insecticides there are available eleven Beaver aircraft with well trained and experienced pilots. Each Beaver is equipped with a standard tank with a capacity of 200 gallons and carries under each wing a spray-boom fitted with 18 nozzles. Usually two Beavers operate from one temporary landing strip near the actual fields to be sprayed. The aircraft take off and land in turn for refuelling and reloading with insecticide. Very little time is lost in ferrying. The emulsified concentrate of endrin, which is afterwards diluted with water, is received from the manufacturers, the Burmah-Shell Company, in steel drums. The concentrate of 19.5% strength contains 1.9 lb. of actual endrin per gallon. The mobil operational bases include a water tanker, spray mixing equipment etc.

The Plant Protection Department of Pakistan carried out successful campaigns against Pyrilla by aerial spraying with endrin. The areas of sugar cane treated increased steadily year by year as shown below:

year:	*acres sprayed:*
1957	51,425
1958	91,470
1959	142,000

Pakistan needs every ton of sugar her own soil can produce and it is encouraging that no efforts are spared to protect the sugar cane crop by adequate pest control.

MALATHION and its Place in Horticulture

By R. F. W. HOLLIDAY, M.A. (*Cyanamid of Great Britain*).

THE discovery of malathion by Cyanamid just over ten years ago represented a major breakthrough in the field of pesticide research.

Until then organo-phosphorus insecticides, while acknowledged to be generally superior to other insecticides for the control of many pests—particularly aphids and spider mites—were at the same time highly toxic to man and animals.

Malathion was the notable exception to this rule, for it proved to be one of the very safest of insecticides to handle, much safer according to comparative toxicity data published by the World Health Organisation in their Technical Report No. 114, than almost all other commonly used insecticides—including DDT and BHC.

For a while people were inclined to be sceptical of the claims made for malathion because they had become accustomed to think of organo-phosphorus insecticides as poisonous substances. For some the name itself was a stumbling block, for there was a mental association of malathion with parathion.

Gradually however prejudice was put aside and today malathion, because of its safety, to plants as well as to man, animals, game and wild life, and its effectiveness against so many kinds of insect pest, is one of the world's foremost insecticides.

Malathion is now used extensively in agriculture and horticulture, and by the amateur gardener.

It is used by public health authorities and others to destroy flies, mosquitoes and bed bugs. It is mixed with grain and oilseeds to control beetles, weevils and other stored products pests. It is applied to livestock, poultry and domestic animals to kill lice, ticks, mites and fleas and in the home to kill cockroaches, silverfish, carpet beetles, clothes moths and a host of other domestic insects.

In fact there seems to be no limit to the uses that continue to be found for malathion. It is indeed an all-purpose insecticide.

The Place of Malathion in Horticulture

Perhaps no one has benefitted more from the discovery of malathion than the horticulturist.

With malathion there is no need to wear protective clothing of any kind even when handling it in a concentrated form, and because it does not present any taint or residue problems it may safely be applied to any crop at any time of the year up to seven days before harvest. In addition it is compatible with most other spray materials and is economical to use.

A further reason why malathion is so valuable in horticulture is that it combines the properties of an insecticide with those of an acaricide. This is a most important consideration for most growers, but especially for growers of top fruit, because on apples and plums, and to some extent pears, the fruit tree red spider mite is a most serious pest. With malathion a grower can contemplate separate action against insect pests such as sawfly, woolly aphid or codling moth with the knowledge that he will at the same time be taking action against red spider mite.

Malathion is now firmly established as a broad

spectrum insecticide for top fruit and it is included in the spray programmes of most progressive growers in this country.

On apples it is applied before blossom to clear up aphids, apple sucker and apple capsid, and after blossom to control sawfly, woolly aphid, bryobia mite, fruit tree red spider mite, leafhoppers and codling moth.

On pears malathion is particularly effective against pear sucker, a pest which seems to be on the increase and one that in recent years has presented a serious problem to many growers.

It is also used to control the same range of pests that are found on apples, namely aphids, sawfly, bryobia mite, leafhoppers, codling moth and red spider mite—where it is found on this crop.

On cherries malathion has given exceptionally good results against cherry blackfly. This is the only species of aphid found on cherries, but it is an important pest for it can cause severe leaf curling and injury to the young shoots and is not always easily controlled with other insecticides.

On plums and damsons malathion is especially recommended for leaf curling and mealy plum aphids, as well as for sawfly, leafhoppers, bryobia mite and red spider mite.

To soft fruit growers malathion offers special advantages.

Its residues disappear rapidly so that it may be applied up to seven days before picking and, because there is no taint problem, the fruit is readily accepted by canners and processors.

For these reasons malathion is now widely used on currants against aphids, capsids, red spider mite and sawfly caterpillars; on gooseberries against aphids, gooseberry red spider mite (bryobia mite) and sawfly caterpillars; on strawberries against aphids, which carry the virus diseases Crinkle and Yellow Edge, and red spider mite; on raspberries, blackberries and loganberries against raspberry beetle and red spider mite, and against aphids and leafhoppers—both of which are now known to carry virus diseases.

For the smallholder, nurseryman and amateur gardener malathion is the ideal insecticide because it can be used with complete safety to control most of the pests that attack flowers and vegetables. To take a few examples: it gives excellent control of aphids on peas, beans, carrots, lettuces, potatoes and brassica crops; of thrips on onions, leeks and other bulb crops; of celery fly on celery and parsnips; of white fly and red spider mite on tomatoes and cucumbers under glass; of phorid and sciarid flies on mushrooms and of aphids, mealybugs, scale insects and leafminers on flowers and ornamentals.

Formulations

Malathion is only slightly soluble in water but is soluble in most petroleum hydrocarbons of high aromatic content.

Therefore, since growers usually prefer liquid insecticides because of the ease with which they can be diluted and applied, malathion is largely marketed in the form of emulsifiable concentrates or miscible liquids.

These concentrates usually contain an aromatic hydrocarbon solvent, an emulsifying agent and five pounds or six pounds of actual malathion per Imperial gallon. If five pounds is used the formulation is referred to as a 50% emulsifiable concentrate, if six pounds a 60% emulsifiable concentrate (e.g. Malathion '60').

Other malathion formulations include wettable powders, dusts and atomisable concentrates, the latter being especially popular with nurserymen under glass and with mushroom growers.

For most horticultural purposes malathion 60% emulsifiable concentrates should be applied at 1½ pints per 100 gallons of water, although under certain circumstances lower rates may be used.

Malathion applied to apples at the Green cluster stage (left) will control aphids, capsids and suckers. If necessary further applications can be given up to seven days before harvest and will promote a good fruit finish such as that on the Cox's Orange Pippins (right).

NEWS

New Weedkiller Plant for U.K.

Shell International Chemical Company announce that they are co-operating with Lankro Chemicals Ltd., of Manchester, to produce the herbicide dalapon (sodium dichlorpropionate). Lankro Chemicals are building a large plant for its production at Eccles in Lancashire and Shell will take the total production. All supplies for the U.K. market will be handled by Shell Chemical Company and in overseas markets by Shell International Chemical Company.

Dalapon is a herbicide of medium persistance which is used for the control of annual and perennial grass weeds. In the U.K. one of the most troublesome of these is couch grass infesting cereals and other crops. To control this weed dalapon is normally applied in the autumn to land which will be sown with the crop the following spring.

The Lankro plant will also be capable of producing chlorpropionic acid which is used for the manufacture of the weedkiller "Proponex" (CMPP) and other phenoxy-propionic weedkillers.

Production is expected to start in the first quarter of 1961.

Dalapon is already being manufactured in the United Kingdom by Dow Agrochemicals at their new factory at Kings Lynn.

Fifth British Weed Control Conference—Provisional Programme

7TH NOVEMBER CONFERENCE ASSEMBLES

	Subject	Speaker	Chairman	Session Organiser
8TH NOVEMBER				
I	*"The Impact of Herbicides on Crop Husbandry"*	(i) Prof. H. G. SANDERS, M.A., Ph.D. (President, British Weed Control Council), (ii) Dr. P. K. BUCHOLTZ (President, Weed Society of America)	Mr. M. N. GLADSTONE	
II	*"Weed Control in Arable Crops"*	Discussion opened by Mr. C. V. DADD	Mr. F. RAYNS	Mr. R. G. HUGHES
III	*"Improvement of Pastures and Hill Grazing"*		Prof. W. ELLISON	Mr. J. G. ELLIOTT
IV	*"Bracken"*		Prof. W. ELLISON	Mr. G. L. HODGSON
9TH NOVEMBER				
V	*"Problems of Advice and Education"*	Discussion opened by Mr. W. E. JONES	Sir JAMES A. SCOTT WATSON, C.B.E., LL.D.	
		(i) A Farmer: Mr. G. E. LIMB (ii) A Merchant: Mr. M. BRADFORD (iii) A Manufacturer: Dr. E. HOLMES		
VI	*"Control of Grass Weeds"*		Dr. W. G. TEMPLEMAN	Mr. J. D. FRYER
VII	*"Weed Control in Horticultural Crops"*	Mr. P. H. BROWN	Mr. DAVID LOWE	Mr. G. W. IVENS
VIII	*"New Herbicides"*		Prof. G. E. BLACKMAN	Mr. K. HOLLY
10TH NOVEMBER				
IX	*"Weeds of Waterways"*	Dr. H. G. VAN DER WEIJ (Netherlands)	Mr. J. V. SPALDING	Mr. J. M. PROCTOR
X	*"New Techniques"*		Dr. E. K. WOODFORD	Mr. S. A. EVANS
XI	*"Translocation and Fate of Herbicides in Plants"*	Dr. C. MCCREADY	Prof. R. L. WAIN	
XII	MEETING		Mr. M. N. GLADSTONE	

Contributions are invited for Sessions II to X of the Conference. All wishing to submit papers or reports are requested to write not later than 31st May, indicating the subject matter, to the Programme Secretary: Mr. C. PARKER, *A.R.C., Unit of Experimental Agronomy, Department of Agriculture, University of Oxford, Parks Road, Oxford.*

PESTICIDE HAZARDS AS IMAGINED BY THE LAYMAN AND SEEN BY THE EXPERT

Continued from page 155

In summing up its report the working party says:—

"*In this report we have made it is clear that if the world's need for more and better quality food is to be met, and until other effective means of controlling pests and diseases become available, the continued use of pesticides is imperative. With many of those chemicals, little or no risk to public health is involved. With some there is a risk that if treatment is applied too near harvest, poisonous matter may remain in the food and be injested by the human body. It would be foolish to deny the risk; it would be equally foolish to exaggerate it. We have tried to explain briefly the great pains that are being taken by public health and agricultural authorities to reduce the risk to negligible proportions. We have pointed out that the national plant protection services are playing an important part in this effort; that if any other method than the use of pesticides is available for the control of a pest or disease, that method is advocated; and that wise guidance is given to the growers so that the pesticides are not applied more heavily or more often than is necessary, and are applied in such a way as to reduce to the minimum any possible danger to health.*"

In our view it should be added—perhaps emphasised—that reputable pesticide producers and their distributors follow the same policy as national plant protection services in advising farmers, growers, and other users, on the control of pests and diseases.

In our next issue we shall be announcing an important series of articles dealing with the benefits that accrue from the proper use of pesticides. These articles will deal not only with agriculture but also with food storage, public health, timber production and the rearing of livestock.

Get rid of pests -

fumigate with

'Embafume'

In silos, stores, mills, barges, ships' holds or any space which can be made gas-proof, 'Embafume' destroys almost every insect pest and parasite, from egg to adult stage. Rats and mice are also killed at very low dosages.

'Embafume' penetrates sacks, wooden boxes and fibreboard cases, and it is widely used in the fumigation of most foodstuffs, including cereals, fruits and vegetables; textiles, timber, and many other products.

It is also used for glasshouse, soil and other horticultural fumigations; seeds can be treated without harming germination.

Detailed information is available on request

'Embafume' METHYL BROMIDE
TRADE MARK BRAND

AN M&B BRAND PRODUCT

MANUFACTURED BY MAY & BAKER LTD - DAGENHAM - TEL: DOMinion 3060 . EXT. 342

NEWS

The Pest Control Operator's Job

The local Pest Advisory Centre, recently held a conference in Glasgow to ". . . . . create a better understanding of both the danger to health and the destruction of goods and property caused by pests; the advances which have been made in pest technology and the means by which pests can be controlled in shops, restaurants, hotels, factories, steel works, hospitals, warehouses and ships".

At the Conference Dr. M. T. Morgan, former Medical Officer of Health to the Port of London, stated that great, indeed dramatic, progress had been made since the war in the search for efficient, safe and reasonably cheap rodenticides and insecticides.

At present there is, unfortunately, no technique or material that would meet all the conditions of efficiency, economy, and safety of an ideal rodenticide, but nevertheless two recent discoveries—Sodium fluoroacetate and the anti coagulants—hold great promise.

Sodium fluoroacetate is a colourless fluffy powder, tasteless, odourless and easily soluble in water. It is highly poisonous to all animals, including humans, and a thimble full of 0.25% solution will kill an adult rat in 20 minutes. Rats take it readily but due to its toxic properties it can only be used under strict supervision by authorised, highly trained personnel in situations where domestic animals, and humans can be prevented from gaining access. In such situations, i.e. sewers, refuse tips, ships etc., infestations can be cleared overnight.

The efficiency of the anti-coagulants, e.g. warfarin, is dependent upon the rodents taking repeated small doses, for example a dose of 0.025 grm./Kg. of body weight taken regularly will reduce the coagulating power of blood in 5-7 days to the point where the recipient dies of internal bleeding.

The fact that the anti-coagulants are indetectable at the doses used no doubt accounts for their success. This indectability, also possessed by sodium fluoroacetate, prevents the rats from becoming bait shy, a defect of many of the older rodenticides such as red squill, arsenic and phosphorous, and consequently the rodents continue to "eat themselves to death".

Dr. Alastair Fraser, Department of Zoology, University of Glasgow, giving his opening address at the Glasgow Pest Control Conference, Central Hotel, Glasgow. Also in the picture are (left to right) D. N. Parsons, Scottish Territorial General Manager, Disinfestation Ltd., Dr. M. T. Morgan, formerly Medical Officer of Health, Port of London, and J. McCue, Sales Manager, Disinfestation Ltd.

After discussing the development of the hydrocarbon and organophosphorous insecticides, Dr. Morgan issued a final word of warning to those present by saying:—

"Rodents and man have lived in competition for thousands of years and there is no simple or easy solution to their control. Careless, haphazard and amateurish methods will not prevail against them.

"Success entails a thorough knowledge of the life history of these pests and a long training and experience in the technique of various control measures and their correct employment in each individual circumstance".

Following Dr. Morgan, Mr. J. M. McCue, an executive of Disinfestation Ltd. discussing the "Scientific Control of Pests" gave an account of the organisation required to tackle industrial pests, and the necessity for surveyors and service staff to keep up to date.

"The term Pest Control Operator" he said, "has been criticised by people who are not fully aware of the nature of the job, as an euphemism for the old fashioned name Rat Catcher. The modern Pest Control Operator is in no way a Rat Catcher—his work involves him in the control of insect as well as rodent pests and even when engaged on rodent control it is rare for him actually to see a rat, let alone catch one, in the original sense of trapping. His job is to apply in the correct way, to the proper places and at the right dosage rates the preparation best calculated to give the desired results in the shortest possible time.

"Dr. Morgan has given an account of two of the most recently developed rodenticides, 1080, and the anti-coagulants, yet Disinfestation finds it essential to supplement these with no less than 6 other entirely different preparations which are kept ready for use in particular circumstances. Even the anti-coagulants can be applied in at least 4 different ways:–

1. The normal bait form of quantity of the drug mixed in oatmeal or sausage rusk.
2. As liquids.
3. As contact dusts and again as whole wheat impregnated with the active ingredient.

"Making the correct decision as to which form of baiting to use is the job of the surveyor initially but thereafter is the responsibility of the operator and success or failure will frequently depend on his ability to make the right decision.

"The decision is influenced by a wide variety of circumstances — whether the infestation is indoors—say, for example, in a warehouse—or outdoors on a poultry farm, whether livestock have access to the infested area—whether the area is dry or damp—whether the rats or mice have access to a readily available alternative food supply and so on. Only by a thorough knowledge of pests concerned and their habits, combined with a knowledge and experience of the advantages and disadvantages of the various forms of the preparation can the appropriate one be chosen.

"In the realms of insect control the problem is even more complex. There is an almost bewildering range of insecticides to choose from—all of them highly effective against certain insects or against insects at a certain stage of development. D.D.T. is normally very effective against flies for example (provided

that a resistant species is not in evidence) but it is almost useless against spider beetles and of little value against khapra beetles (a common pest of maltsters). Even the two sexes of the same species differ in their reaction to insecticides. The females are nearly always more resistant to the effects of an insecticide than the males.

"Having decided on the insecticide to use the problem then arises of dosage rates. At what strength should the preparation be applied to give effective results against the particular species and in the particular circumstances?

"Once that is decided there comes the question of the form in which the insecticide is to be applied."

"It may be of interest to you to learn that there are no less than 6 different ways in which insecticides are regularly applied.

"Perhaps the most common is as a powder or dust. A small quantity of the active ingredient is mixed with a much larger quantity of inert filler and scattered or blown wherever the insects are harbouring."

"Also familiar are the sprays. Most people will have seen or used kerosene based sprays and will readily recognise the small hand atomiser with which enthusiastic gardeners pursue green fly on their rose bushes. But most insecticides can also be formulated as emulsions for dilution in water and the choice of oil or water as the base can be important when an attempt is being made to obtain an insecticidal film on wall surfaces. The type of wall surface will determine the choice.

"Also fairly familiar will be the smoke candle or insecticidal smoke generator which when lit gives off a cloud of smoke containing minute particles of insecticide—usually BHC or D.D.T. Contrary to popular opinion however, the smoke does not asphyxiate the insects with which it comes in contact, it covers them and their surroundings with insecticidal dust which kills in the normal way of an insecticide.

"Less widely known are the insecticidal laquers which dry hard and clear after application but which produce an invisible bloom of insecticide lethal to insects crawling on it. The lacquer and insecticidal surface is virtually indestructible and will remain effective for up to 12 months and even longer."

Then there are machines which produce a fog. Literally, clouds of insecticidal fog are belched out and if the correct insecticide is 100% knockdown of winged insects will result.

"All these methods are in regular use by scientific pest control companies and I think you will agree that the modern Pest Control Operator has really something to think about.

"But putting highly effective tools of his trade in the hands of a Pest Control Operator, giving him intensive and continuous training, and years of experience are still not a guarantee of complete success. New problems arise, insects fight back by developing resistance, new methods of control must be devised and specific solutions found to special problems. A successful Pest Control organisation must have behind the men in the field properly organised scientific research laboratories."

Mr. McCue pointed out that at Disinfestation's own laboratories, there is a staff of entomologists, chemists and bacteriologists, who spend their whole time testing new preparations, investigating and advising on problems from the regions and searching the vast amount of current literature on world pest problems to ensure that the operators etc. are immediately appraised of any advances which may be made in control techniques.

"Without this close link between the practical field man and the scientific worker" he added, "no pest control organisation can hope to succeed for very long."

"Continuity is the essence of Pest Control because pests, like the poor, are always with us and have an unhappy knack of finding their way back into premises which have been cleared. How insect infestations are spread from place to place in containers of every type would make an interesting talk in itself and mention of rat proof or mouse proof buildings always makes a trained Pest Control Operator smile. Where people can go rats and mice will and usually do go. Only regular service can ensure complete control over long periods.

"Pest Control is a highly skilled business involving the use of complex chemicals in a variety of forms to meet particular circumstances."

New Knapsack Sprayer

E. Allman & Company Ltd., of Chichester have added an engine-driven knapsack mistblower to their range of sprayers.

The Mistblower is powered by a 2-stroke 26 cc. engine running at 4,500 r.p.m. The fan being of special design directly mounted to crankshaft of engine, the diameter being 9⅝ ins. (245 mm.). The spray tank is flexible plastic and holds 2.3 imperial gallons (10.6 litres) and is pressurised by air by-pass from fan. The nozzle, which is easily handled by the operator, is made of plastic with output regulator. The shoulder straps, being leather and fully adjustable are easily fastened and unfastened.

Thick anti-vibration padding is fitted to protect the operator and the unladened weight of the machine is only 26 lbs. (11.7 kilo.).

The machine is readily available and on the Home market the retail price is £69 10s. 0d. carriage paid to the user.

Standard equipment includes belt start to the engine, but recoil starters can be supplied in lieu of belt start at small extra charge.

Allman's new mist blower in action

NEWS and EVENTS

Ross Institute Lay Course in Tropical Hygiene

The annual course for laymen will be held by the Ross Institute this year from Monday, 4th July to Friday, 8th July inclusive.

The course is designed specially for planters, mining engineers and other non-medical people who may be responsible for the health of industrial labour forces in the tropics. Admission is not restricted to such people, however, but is open to any non-medical men and women proceeding to the tropics.

The course consists of some formal teaching which is liberally illustrated by films, visits and demonstrations. The subjects covered include malaria and its control, other tropical diseases, nutrition, housing, sanitation, and protection against heat. The teaching is given by leading experts in each subject.

There is no fee for the course. Recognising its value, many companies pay the expenses of their staff during their stay in London, and the Ross Institute Standing Committee hopes that this practice will become general.

It would be appreciated if agencies and firms would inform their managers and assistants that this course is being organised and would encourage and assist them to attend. The names of those proposing to attend should be sent as soon as possible to the Organising Secretary, but amendments and additions may be made at any time up to the date of commencement of the course.

It would be helpful if intending students would state their occupation and the country or district to which they are going. This will enable the organisers to arrange the programme according to requirements.

Further information on the detailed arrangements will be sent to those who have enrolled about a month prior to the date of the course and is obtainable from:—

L.G. Ponsford, Organising Secretary,
Ross Institute of Tropical Hygiene,
London School of Hygiene and
Tropical Medicine, Keppel Street
(Gower Street), London, W.C.1.

British Wood Preserving Association 1960 Convention

The 1960 Convention will be held at Cambridge University from Tuesday, 12th July to Friday, 15th July. Delegates will assemble for dinner in college on the evening of Tuesday, 12th July and the first official session will be held in the University Lecture Rooms, Sidgwick Avenue at 9-30 a.m. on Wednesday, 13th July. The official meetings will continue throughout the days of Wednesday and Thursday, 13th and 14th July. The Convention will end after breakfast on the morning of Friday, 15th July. On the evening of Tuesday, 12th July an informal reception for all delegates will be held in the Hall of Pembroke College from 9-0 p.m. to 10-15 p.m. Tea, coffee, soft drinks and light refreshments will be served and a bar will be available from which drinks may be purchased.

On the evening of Thursday, 14th July the Official Reception and Dinner will be held at the Dorothy Restaurant at 7-30 p.m. for 8-0 p.m. *Dinner jackets will be worn at this function.* Applications to attend the Convention should be made *not later than 24th June*, 1960.

Accommodation has been reserved in Clare, Pembroke and Sidney Sussex Colleges but it is *not* possible for ladies to be given accommodation in college, although they may take meals at Pembroke College, other than breakfast, provided the Secretary of the Association is informed *before 5th July.*

Hotel accommodation is very limited in Cambridge particularly during the period 12th July to 15th July. Any lady wishing to attend the Convention should, therefore, make early application to the hotel at which she intends to stay.

The following is a list of papers to be presented:—

1. A paper by Dr. N. E. Hickin, Technical Director, Rentokil Ltd. on "An Introduction to the Study of the British *Lyctidae*".
2. A paper by Mr. Douglas Grymes of Koppers Co. Inc. U.S.A. relating to developments in wood preservation in the U.S.A.
3. A paper by Professor Antunovic Kobliska of Belgrade University, dealing with timber preservation in Yugoslavia.
4. A paper by Mr. M. N. Salmon, Director of Hickson's Timber Impregnation Co. (G.B.) Ltd. dealing with Fire Retardants applied by pressure impregnation.
5. A paper by Mr. R. Fenner, Director of Albi-Willesdan Ltd. dealing with Fire Retardants applied by surface treatment.
6. A paper by Mr. Tecwyn Jones, Forest Entomologist of the East African Agriculture and Forestry Research Organisation on insect borers which attack living trees and continue their depredations in sawn and seasoned timber.
7. A paper by the Secretary of B.W.P.A. on the work and activities of the Association, outlining the developments and progress which have taken place during recent years.

The Summary of Papers will be presented by Mr. C. W. Nichol on the afternoon of Thursday, 14th July.

Further information may be obtained from:—

Wm. E. Bruce, M.A. (Cantab),
Secretary,
British Wood Preserving Association,
6, Southampton Place,
London, S.W.1.

Advisory Committee on Scientific Work of Infestation Control Laboratory

The Minister of Agriculture, Fisheries and Food has appointed a Committee, under the chairmanship of Professor J. B. Cragg, B.Sc., M.Sc., Professor of Zoology in the University of Durham, to advise and report annually on the programme of experimental and research work of the Infestation Control Laboratory of the Ministry.

The members of the Committee are:—

Mr. H. R. Hewer, M.Sc.,
Reader in Zoology, Imperial College of Science and Technology.

Dr. T. Moran, C.B.E., D.Sc., Ph.D.,
Director of Research for the Research Association of British Flour Millers, St. Albans, Herts.

Mr. F. Rayns, C.B.E., M.A.,
Director of the Norfolk Agricultural Station, Sprowston, Norwich.

Professor H. G. Sanders, M.A., Ph.D.,
Chief Scientific Adviser (Agriculture), Ministry of Agriculture, Fisheries and Food.

Professor V. C. Wynne-Edwards, M.A., F.R.S.C., Department of Natural History, University of Aberdeen.

The Secretary of the Committee is Miss Y. Larthe, B.Sc.

Assessors to the Committee are:—

Mr. A. S. Fortune, C.B.E., T.D., B.Sc.(Agr.), Chief Inspector, Department of Agriculture for Scotland.

Dr. R. A. E. Galley, Ph.D., A.R.C.S., D.I.C., F.R.I.C., Director, Tropical Products Institute, Department of Scientific and Industrial Research.

Mr. G. V. B. Herford, O.B.E., M.Sc., Director, Pest Infestation Laboratory, Slough, Bucks.

Mr. G. G. Samuel, M.Sc., Agricultural Research Council.

Dr. E. B. Worthington, M.A., Ph.D., Deputy Director-General (Scientific), Nature Conservancy.

The Terms of Reference of the Committee are:—

" To advise and report annually on the programme of experimental and research work on infestation control, and on the co-ordination of that work with related work elsewhere ".

Research Study Group on Toxic Chemicals in Agriculture

The Research Study Group, which was appointed by Ministers to study the need for further research into the effects of the use of toxic chemicals in agriculture and food storage, has begun its inquiries.

The Group is prepared to receive written evidence of views on the subject of the inquiry from persons or organisations. Written evidence should be addressed to the Secretary of the Group, Dr. E. J. Miller, Plant Pathology Laboratory, Hatching Green, Harpenden, Herts.

Two New Offices for Dow International

Deutsche Dow Chemie GmbH have announced the opening of a new marketing office in Frankfurt, which will handle the marketing of Dow chemicals, plastics and agricultural products in Germany, Austria and Switzerland. Actual sales in these countries will be processed as before through appointed sales representatives. The manager of this office will be James C. Tucker, B.Sc., who has been associated with Dow since 1950.

Almost simultaneously the Dow Chemie Italiana S.p.A., the newly formed subsidiary, announced the opening of a marketing office in Milan, to handle the marketing of Dow products in Italy, Greece and the Near East. Roger R. Zoccolillo who has been associated with Dow since 1953, will be the new manager.

New Timber Storage Shed is Treated with Celcure

Approximately six standards of treated timber have been used in the construction of a new timber storage shed for W. J. Clemow & Son Ltd. at their works at Par in Cornwall.

The shed which has an 82ft. frontage, is 105ft long and has a storage capacity for 210 standards of timber. All the timber that was used for the construction of the shed—European Redwood—was supplied by Clemows themselves and treated with Celcure by their associate company, the Plymouth and Oreston Timber Co. Ltd.

The company's decision to construct their new storage shed of timber represents a welcome affirmation by a member of the trade of the fact that timber is a material that the trade itself can make use of, and not one that is simply to be sold. Clemows are so satisfied with their storage shed that they have another building under construction to house their new saw mill.

View showing new 'Celcure Treated' timber storage shed for W. J. Clemow & Son Ltd., Timber Importers and Builders' Merchants.

M.A.F.F. re-issue Warning of the Danger to Bees

Bees are good friends of farmers and fruit growers. Don't kill them with insecticides and weed killers at times of spraying and dusting. Co-operation with local beekeepers can do much to save bees from poisoning. As well as producing honey, bees do essential work in pollinating fruit and seed crops. Everyone interested in the production of crops, therefore, whether professionally or in the garden, has common interests with the bee-keeper in the welfare of bees.

The Ministry of Agriculture, Fisheries and Food appeals for greater co-operation and consultation between bee-keepers, farmers, fruit growers, market gardeners, gardeners and spraying contractors to obtain a better understanding of the problems of all parties.

The following precautions should be taken to avoid killing bees:—

1. Don't use insecticidal sprays or dusts on open blossom in orchards or on seed crops in flower, especially rape, mustard and other brassicae which should be sprayed before the blossom opens.
2. Carry out chemical weed control on cereal crops before the weeds reach the flowering stage. This applies particularly to charlock, whose flowers are very attractive to bees.
3. Never use arsenic in orchards except (a) before the flower buds open and (b) after complete petal fall. Arsenic is deadly to bees.
4. Clean cultivate or gang-mow orchards immediately before applying poisonous chemicals.
5. Avoid letting sprays and dusts drift on to hedgerow flowers or neighbouring fields where bees are foraging.
6. Take care not to dump waste chemicals or empty containers where they might contaminate ponds or other places likely to be used by bees for drinking.
7. Beekeepers should be on the look-out for local crops likely to be treated and should approach the growers about the timing of pest control operations or obtain a warning of impending action.

PUBLICATIONS RECEIVED——

The Scientific Principles of Crop Protection. 4th Edition

By H. Martin, Published by Edward Arnold, London. Price 65s.

The purpose of this book, is to survey the scientific principles underlying modern methods of control of crop pests and by so doing will assist the co-operation, between entomologists, mycologists, chemists, physicists and physiologists, which is so necessary for the economic and successful progress of crop protection.

The author assumes that the reader will already have some experience in crop protection at least in his own field. The greater emphasis is upon presenting to the biologist a detailed survey of the physico chemical factors involved in pest control and to a slightly lesser extent provides the chemist with an approach to the biological aspect.

The first three chapters following the introduction deal with (a) Plant resistance, the production and use of resistance varieties and the nature of plant resistance to pathogens and insects; (b) The influence of External factors on the susceptibility and liability of the plant to attack, including nutrition, fertilisers, soil conditions, climatic factors, meteorological forecasting of epidemics, control of temperature and humidity relationships and modification of the time of sowing; (c) Biological control, including basic principles, the use of higher animals, the use of insects against weeds and other insects, and the use of bacterial, fungal and virus diseases against pests.

Following these chapters is one on the principles underlying the use of fungicides and insecticides as sprays, dusts, fumigants, the use of spreaders, stickers, protective colloids, dispersing and emulsifying agents. Then after a chapter analysing the principles of bioassay, probit analysis and the mechanics of toxic action, the next 6 chapters deal with the chemistry and mode of action of the various groups of insecticides, fungicides, weedkillers and fumigants, also, following the modern trend, their chemical structure is related to their activity.

The remaining four chapters account for seed treatment, soil sterilisation, the use of traps, attractants and repellents and finally the treatment of centres and vectors of infection.

Dr. Martin has dealt remarkably well with a large and (despite his assurance that scientific principles permit classification and co-ordinated discussion) complex subject and one feels that any criticism which may be made is a result of the reviewers own lack of knowledge.

The author could not hope to do more than outline the important fields of work within the subject, these outlines may be insufficient for the research worker in his own field yet too complex for someone with inadequate knowledge of that field, however, should anyone be puzzled by a particular chapter an excellent series of references is given at the end of each and will be of great assistance.

To sum up, it is a reference or text book for the initiated, i.e. the advisory officer or research worker who has had experience of the research involved in crop protection. It will provide him with a guide to developments in other fields, but he may have to recourse to other literature to gain detailed information.

It is a credit to the author who has dealt excellently with a diverse and difficult subject.

Parasitic Animals. Second Edition
By G. Lapage. Published by W. Heffer and Sons, Cambridge. Price 25s.

"It covers a very wide variety of parasitic animals, but it is not a textbook of economic parasitology, being designed to emphasise the fundamental biology of parasites rather than their economic importance. The book is well written and abundantly illustrated"—*Discovery.*

". . . . a most interesting, readable and very useful book. It will appeal to specialists and general Zoologists alike and certainly should be read by all students whose course include a consideration of animal parasitism. Even the lay reader will be able to follow its clear style without too much difficulty and find in it much that is of interest and thought provoking"—*Nature.*

The above are extracts of reviews of the first edition, and needless to say they still apply.

The fact that few alterations have had to be made in the second edition is an impressive compliment to the author and the corrections that have been made further enhance its usefulness.

The first edition gave one the impression that here was the book for the student, not too much detail to muddle his thinking but just sufficient to illustrate the fundamental biology of parasites. With this basic knowledge firmly implanted in his mind he could then follow the subject in a balanced, logical manner.

Upon reading the second edition this opinion is further strengthened but in addition one gains the impression that it is also of value to the specialist, for by re-reading this book (which is not a hard task by any means) he can find out whether or not he is still on the right track.

All told, this book, because of its concentration on basic knowledge, will be of value for many years.